

WHAT IS CLAIMED IS:

- 1                   1.       A method of automatically assembling a printed circuit board  
2 assembly (PCBA) in an assembly apparatus, comprising the steps of:  
3                   a) receiving, in the assembly apparatus, a programmable electronic device  
4 to be programmed;  
5                   b) automatically programming the electronic device in the assembly  
6 apparatus;  
7                   c) receiving a printed circuit board in the assembly apparatus; and  
8                   d) assembling the PCBA in the assembly apparatus by automatically  
9 placing the programmed electronic device on the printed circuit board so as to form the  
10 PCBA.
- 1                   2.       The method of claim 1, further comprising the step of testing the  
2 programmed electronic device prior to assembling the PCBA.
- 1                   3.       The method of claim 2, wherein if the programmed device fails the  
2 test, the method further includes discarding the programmed electronic device and  
3 repeating steps a) and b) with a second programmable electronic device.
- 1                   4.       The method of claim 1, wherein step b) includes the step of  
2 transferring a sequence of operating codes into a memory of the programmable electronic  
3 device.
- 1                   5.       The method of claim 1, wherein the programmable electronic  
2 device is a programmable logic array, and wherein step b) includes the step of  
3 transferring an arrangement of gating logic instructions into the programmable logic  
4 array.
- 1                   6.       An assembly apparatus capable of automatically assembling a  
2 printed circuit board assembly (PCBA), the apparatus comprising:  
3                   means for receiving, in the assembly apparatus, a programmable electronic  
4 device to be programmed;

5 means for automatically programming the electronic device in the  
6 assembly apparatus;

7 means for receiving a printed circuit board in the assembly apparatus; and

8 means for automatically placing the programmed electronic device on the  
9 printed circuit board so as to form the PCBA.

1 7. The apparatus of claim 6, further comprising means for testing the  
2 programmed electronic device prior to assembly of the PCBA.

1 8. The apparatus of claim 7, further comprising means for discarding  
2 the programmed electronic device if it fails a test.

1 9. The apparatus of claim 6, wherein the means for programming  
2 includes a means for transferring a sequence of operating codes into a memory of the  
3 programmable electronic device.

1 10. The apparatus of claim 6, wherein the programmable electronic  
2 device is a programmable logic array, and wherein the means for programming includes a  
3 means for transferring an arrangement of gating logic instructions into the programmable  
4 logic array.

1 11. An in-line programming and assembly apparatus capable of  
2 automatically programming electronic devices and assembling printed circuit board  
3 assemblies (PCBAs), the apparatus comprising:

4 an input interface for receiving a plurality of programmable electronic  
5 devices, wherein a first programmable electronic device is received at the input interface;

6 a programming device for automatically programming electronic devices,  
7 the programming device having a plurality of programming sites;

8 a placement device capable of picking up an electronic device from, and  
9 placing the electronic device at, a plurality of specific locations, wherein the placement  
10 device picks up the first programmable device and places it in a first one of the  
11 programming device sites, and wherein the first electronic device is programmed by the  
12 programming device; and

13                   a conveyor for receiving printed circuit boards and moving the printed  
14 circuit boards through the assembly apparatus, wherein a first printed circuit board is  
15 received by the conveyor;

16                   wherein the placement device picks up the programmed first electronic  
17 device from the first programming site and places the programmed device on the first  
18 printed circuit board so as to form a first PCBA.

1                   12.     The apparatus of claim 11, further comprising a central control unit  
2 communicably coupled to the pick and place device, the programming device and the  
3 conveyor, for coordinating operations of the pick and place device, the programming  
4 device and the conveyor.

1                   13.     The apparatus of claim 11, wherein the input interface includes a  
2 device tray shuttle for receiving a device tray holding one or more programmable devices.

1                   14.     The apparatus of claim 11, wherein the programming device is  
2 capable of concurrently programming multiple device types.

1                   15.     The apparatus of claim 11, wherein the conveyor delivers the first  
2 PCBA to an exit location within the apparatus.

1                   16.     The apparatus of claim 11, wherein the first programmable  
2 electronic device is a programmable logic array device, and wherein the programming  
3 device transfers an arrangement of gating logic instructions into the programmable logic  
4 array device.

1                   17.     The apparatus of claim 11, wherein the programming device  
2 programs the first electronic device by transferring a sequence of operating codes into a  
3 memory of the first electronic device.

1                   18.     The apparatus of claim 11, wherein the programming device tests  
2 the programmed first electronic device after it has been programmed.